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Cardiometabolic diseases

Doenças cardiometabólicas

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ABSTRACT: ***Introduction:*** Cardiometabolic diseases are prevalent in populations and are among the leading causes of death. ***Objective:*** This sub-study of the Health, Well-being and Aging (SABE) study describes the self-reported prevalence of diabetes mellitus (DM), hypertension, and atherosclerotic cardiovascular disease (CVD) for its three waves (2000, 2006, and 2010). It also analyses the associations with selected risk factors. ***Methods:*** Logistic regression models were performed. ***Results:*** Predominance of women and average age (68 years) were maintained in all the waves. During the period, there was a general tendency of increasing prevalence of hypertension (53.1 to 66.7%), DM (16.7 to 25.0%), and CVD (23.0 to 27.2%); and stabilization of the CVD prevalence rate occurred only from 2006 to 2010. Women, with body mass index (BMI) > 27 kg/m², and ex-smokers had consistently higher risk of self-reported hypertension across the three waves. BMI > 27 kg/m² was also associated with a higher probability of DM in the three waves, whereas with ex-smokers this occurred only in 2010. Ex-smokers presented higher risk of CVD in all the waves, but not excess weight. Wave pairs were analyzed to test changes in prevalence, and it was found a significant increase in diseases rates across the years. ***Conclusion:*** In summary, self-reported DM, hypertension, and CVD had high prevalence rates for participants of SABE Study, in São Paulo. The association of elevated BMI with cardiometabolic diseases suggests that body adiposity might favor their occurrence, although the study design does not guarantee a cause and effect relationship. Increased rates of affected individuals from the first to the third wave may reflect improvement in diagnostic conditions and/or control of these diseases' mortality during that period.

Keywords: Diabetes mellitus. Hypertension. Cardiovascular diseases. Aging. Prevalence. Risk factors.

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RESUMO: ***Introdução:*** Doenças cardiometabólicas são prevalentes nas populações, estando entre as principais causas de morte. ***Objetivos:*** Este subestudo do Saúde, Bem-Estar e Envelhecimento (Sabe) descreve as prevalências autorreferidas de hipertensão, diabete mellitus (DM) e doença cardiovascular aterosclerótica (DCV) nas suas três ondas (2000, 2006 e 2010) e analisa a associação com fatores de risco selecionados. ***Métodos:*** Empregou-se regressão logística. ***Resultados:*** O predomínio de mulheres e a idade (68 anos) foram mantidos nas três ondas. No período, verificou-se tendência geral de aumento nas prevalências de hipertensão (53,1 a 66,7%), DM (16,7 a 25%) e DCV (23,0 a 27,2%) – estabilização da prevalência de DCV apenas de 2006 a 2010. Indivíduos do sexo feminino, com índice de massa corporal (IMC) > 27 kg/m² e ex-fumantes tenderam consistentemente à maior probabilidade de hipertensão autorreferida ao longo das ondas. Apresentar IMC > 27 kg/m² associou-se à maior probabilidade de referir DM nas três ondas, enquanto com ex-fumantes isso aconteceu apenas em 2010. Ter sido fumante também se associou à DCV nas ondas, mas não o excesso de peso. Averiguando-se pares de ondas para testar alterações nas prevalências, viu-se que em geral houve elevação significativa nos percentuais das doenças com o tempo. ***Conclusão:*** Em suma, DM, hipertensão e DCV autorreferidos ocorreram com elevadas prevalências nos participantes do Sabe em São Paulo. A associação de IMC elevado com doenças cardiometabólicas sugere que adiposidade corporal pode favorecê-las, embora esta análise não permita assegurar relação causa × efeito. É possível que o aumento dos percentuais de doentes da primeira para a terceira onda reflita melhora nas condições de diagnóstico e/ou no controle dessas doenças no período.

Palavras-chave: Diabetes mellitus. Hipertensão arterial. Doenças cardiovasculares. Envelhecimento. Prevalência. Fatores de risco.

INTRODUCTION

When the Study on Health, Well-being, and Aging (*Estudo Saúde, Bem-Estar e Envelhecimento* – SABE)[1] was first conceived, at the end of the twentieth century, researchers envisioned the growing representation of the age range ≥ 60 years in the population pyramids, and were concerned with the impact of this scenario on the health of individuals and the economy of nations. In this century, the three stages of the SABE study have been collecting relevant information about the life and health conditions of the elderly in urban areas of the city of São Paulo. Quality data accumulated over time regarding risk factors, morbidity, and mortality are essential for the planning of health actions. In this sense, the self-evaluation of the health status by the participants in the first stage of the SABE, in 2000, already showed the importance of noncommunicable chronic diseases (NCDs), consistent with the current concerns of the international health organizations[2]. Among them, we highlight hypertension, diabetes mellitus (DM), atherosclerotic cardiovascular disease (CVD), osteoarticular affections, and cancer[1].

The aging of the populations represents one of the most relevant reasons for the NCDs to have become a major worldwide threat to health. It is estimated that the population ≥ 60 years of age living in Latin America and Caribbean will double at least once in the period from 1980 to 2025 and, on average, in more than half of the countries, it will be

tripled before 2025[3]. The Global Burden of Disease Study (2010) indicates that today the infectious diseases and malnutrition affect the health less than they did 20 years ago, and that the NCDs have become the leading causes of mortality in developed and developing countries[4]. The importance of risk factors for the improvement of life expectancy has changed considerably, shifting the focus on communicable diseases and infant age range to noncommunicable diseases among adults and elderly populations. Recently, the three main risk factors pointed out were high blood pressure, smoking, and air pollution, followed by dietary factors and physical inactivity[5]. For all these factors, there is consistent evidence of their effect on metabolic diseases, NCDs, and cancer.

Among the metabolic diseases, the type 2 DM (DM2) stands out as a public health problem not only because of the number of affected individuals, but also because of the severe impairment of the quality of life in face of the complications and the governmental burden to the health system, particularly in Latin America[6,7]. In addition to population aging, the excess weight resulting from inappropriate life habits has contributed to the higher occurrence of DM2. This same scenario also contributes to elevate the risk of hypertension and, consequently, CVDs.

Hypertension affects about one-fourth of the worldwide population, and is predicted to increase by 60% in the number of cases by 2025[8]. In Brazil, despite the heterogeneity in their methodologies, studies show its prevalence varying between 20% and 30%, increasing with age and body adiposity[9,10]. The CVDs are responsible for at least 30% of deaths worldwide[11]. In 2009, a similar number was observed in Brazil[12]. Despite the decrease in mortality rates by cardiovascular events, the lack of control of obesity and DM has limited greater reductions.

Cancer is also in the public health agenda of both developed and developing countries[13]. The systematic collection of data in Brazilian population-based records have made possible the monitoring over time, incidence estimates, and research on the determinants of cancer[14]; however, self-reported cases are not appropriate for such purposes, because of their prominent underreporting. Prostate and breast cancer have a broad predominance in their respective gender. Unhealthy life habits, particularly smoking, figure as risk factors for cancer in general.

There is a lot to be done to improve the prediction, prevention, and control of NCDs. Their prevalence in emerging countries such as Brazil tends to aggravate socioeconomic problems, hindering the application of resources in the health system. The investigation of trend factors and risk behaviors to guide prevention and control strategies is urgent. The Surveillance for Risk Factors and Protection for Chronic Disease by Telephone Survey (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* – Vigitel), by its objective and design, has brought important contributions in this direction[15]. However, the SABE[1] study gathers valuable information for the age range with the fastest growth in Brazil. This sub-study first focuses on cardiometabolic diseases – hypertension, DM, and CVD – in an attempt to describe the self-reported prevalences in the three waves of the matrix study carried out in São Paulo. Second, the association of these diseases with selected risk factors was analyzed.

MATERIALS AND METHODS

For this cross-sectional sub-study, the results of the three waves (2000, 2006, and 2010) of the SABE study, carried out in the municipality of São Paulo, were used. The initial work, from 2000, was part of a multicentered analysis of data collected in seven countries, coordinated by the Pan American Health Organization[1]. From 2006 onward, the study became longitudinal and its last wave was carried out in 2010. The research was approved by the Ethics Committee of the Public Health School of the Universidade de São Paulo, and the participants signed an informed consent form.

This article is part of the SABE study, whose complete methodology is found in the first article of this supplement[(1)].

For this study, we used the information about the presence of chronic diseases, inferred by the following question: "Has any doctor or nurse ever told you that you have [...]?" as outcome variables. In this analysis, the three most frequent NCDs reported by the interviewees – hypertension, DM, and CVD – were included as cardiometabolic diseases. The CVD was defined as a report of a circulatory event in the coronary territory (angina, acute myocardial infarction, or heart failure) or in the brain (stroke) within the last 12 months. At first, the prevalence rates of each disease were analyzed separately for the three waves of the SABE study. As explanatory factors, the variables gender, age, marital status (categorized as single, married/living together, separated/divorced, and widowed), education (according to the number of completed years of schooling), body adiposity (according to the body mass index – BMI – dichotomized in BMI ≤ 27 and > 27 kg/m^2)[16], and smoking (categorized into never smoked, ex-smoker, and smoker) were included.

In the descriptive analysis of the variables for the three waves, the sample weights of the study were considered, to ensure representativeness for the population distribution. In the regression models, which had the objective of identifying individual associations, the unweighted results were used[17]. For the statistical analysis, logistic regression models were adjusted separately for the three dependent variables, including as independent variables the socioeconomic characteristics and the risk factors. Finally, there was a joint analysis of the pairs of waves to identify changes in the presence of diseases throughout the years. For example, to analyze the statistically significant change present in hypertension in 2006 in relation to 2000, all the observations from 2000 and 2006 were included in the logistic model, adding a time dummy to the independent portion of the model. All coefficients of the logistic models were presented in terms of *odds ratio* (and confidence intervals of 95%) to facilitate interpretation. The statistical analyses were carried out with the support of the Stata® 13 software.

RESULTS

The samples of the three waves of the SABE study totaled 2,143 individuals in 2000 (cohort A), 1,413 in 2006 (cohorts A and B), and 1,344 in 2010 (cohorts A, B, and C). Table 1 shows the

[(1)]Duarte YAO, Santos JLF, Silva NN. 10 Anos do Estudo SABE: antecedentes, metodologia e organização do estudo. Rev Bras Epidemiol. 2018; 21 Suppl 2: e180002.sup2. http://dx.doi.org/10.1590/1980-549720180002.supl.2

variables of interest in each wave. In the period of 10 years, a general trend of increased prevalence of hypertension (from 53.1 to 66.7%), DM (from 16.7 to 25%), and CVD (from 23 to 27.2%) was found, except for the stabilization in the prevalence of CVD from 2006 to 2010. Regarding demographic characteristics, the proportion between genders in the sample (a predominance of women between 59 and 60%) and average age (68 years) remained the same. A gradual increase in the proportion of separated/divorced and widowed individuals,

Table 1. Distribution of the general characteristics and prevalences of cardiometabolic diseases of the participants in the three waves of the SABE study, living in the municipality of São Paulo.

	2000 (%)	2006 (%)	2010 (%)
Gender			
Female	58.8	59.4	59.9
Male	41.2	40.6	40.1
Marital status			
Single	4.9	4.3	3.5
Married/Living together	57.1	57.4	54.8
Separated/Divorced	8.6	7.7	10.1
Widowed	29.5	30.7	31.7
Education (years)			
0 to 4	77.6	73.7	63.6
5 to 8	9.2	12.4	15.0
≥ 9	13.2	13.9	21.4
Smoking			
Never smoked	52.1	52.0	51.0
Already smoked	32.0	34.0	37.1
Currently smokes	15.8	14.0	11.9
Body mass index			
≤ 27 kg/m^2	59.1	57.0	43.9
> 27 kg/m^2	40.9	43.0	56.1
Cardiometabolic diseases			
Hypertension	53.1	62.7	66.7
Diabetes mellitus	16.7	21.1	25.0
Cardiovascular disease	23.0	27.7	27.2

in the number of years of schooling, and in the proportion of overweight elderly (BMI > 27 kg/m²), as well as a decreased percentage of smokers, was observed.

Table 2 shows the results of the logistic model for the factors associated with hypertension. Women had a statistically significant higher probability of reporting hypertension in the three waves. Higher education was associated with lower occurrence of hypertension, although this association has not been invariably significant for the whole change of stratum. Individuals with BMI > 27 kg/m² and ex-smokers had a consistent tendency of higher probability of hypertension in all waves of the study.

In Table 3, we observe the results of the model, which included self-reported DM as a response variable. In this case, it was observed that having a BMI > 27 kg/m² was the only consistent risk factor connected to higher probability of reporting DM in the three waves. Being an ex-smoker was significantly associated with the presence of this disease only in 2010.

Table 4 presents the results regarding the associations with CVD. Being an ex-smoker was interconnected with the report of CVD in the three waves. Unlike the other two diseases, excess weight was not associated with CVD in any of the waves.

Table 2. Determinants of the presence of self-reported hypertension for participants of the three waves of the SABE study, living in the municipality of São Paulo.

	2000		2006		2010	
	OR	95%CI	OR	95%CI	OR	95%CI
Gender	1.14	1.07 – 1.20	1.11	1.04 – 1.18	1.12	1.05 – 1.19
Age	1.00	1.00 – 1.00	1.00	1.00 – 1.01	1.01	1.00 – 1.01
Marital status						
Married	1.01	0.91 – 1.13	1.05	0.92 – 1.19	1.04	0.91 – 1.20
Separated/divorced	0.89	0.77 – 1.01	0.94	0.80 – 1.09	0.92	0.79 – 1.08
Widowed	1.02	0.91 – 1.14	1.03	0.90 – 1.17	1.01	0.87 – 1.16
Schooling (years)						
5 to 8	0.91	0.83 – 0.98	0.94	0.87 – 1.02	1.03	0.95 – 1.11
≥ 9	0.94	0.88 – 1.02	0.93	0.86 – 1.01	0.95	0.89 – 1.02
BMI						
≥ 27 kg/m²	1.17	1.11 – 1.22	1.15	1.09 – 1.21	1.18	1.12 – 1.25
Smoking						
Ex-smoker	1.08	1.02 – 1.14	1.08	1.02 – 1.15	1.06	1.00 – 1.13
Currently smokes	1.03	0.95 – 1.10	0.93	0.85 – 1.01	0.99	0.90 – 1.08

OR: *odds ratio*; 95%CI: confidence interval of 95%.

Table 3. Determinants of the presence of self-reported diabetes mellitus for participants of the three waves of the SABE study, living in the municipality of São Paulo.

	2000		2006		2010	
	OR	95%CI	OR	95%CI	OR	95%CI
Gender	1.03	0.98 – 1.07	1.02	0.96 – 1.07	1.04	0.98 – 1.11
Age	1.00	1.00 – 1.00	1.00	1.00 – 1.00	1.00	1.00 – 1.00
Marital status						
Married	1.04	0.96 – 1.13	1.08	0.96 – 1.20	1.09	0.95 – 1.24
Separated/divorced	0.98	0.88 – 1.08	1.03	0.90 – 1.18	1.02	0.88 – 1.19
Widowed	1.04	0.95 – 1.13	1.08	0.97 – 1.21	1.10	0.96 – 1.26
Schooling (years)						
5 to 8	0.99	0.93 – 1.06	0.98	0.91 – 1.05	1.02	0.95 – 1.10
≥ 9	0.99	0.93 – 1.05	0.94	0.88 – 1.01	1.00	0.93 – 1.07
BMI						
≥ 27 kg/m²	1.05	1.02 – 1.09	1.05	1.00 – 1.10	1.09	1.03 – 1.15
Smoking						
Ex-smoker	1.02	0.97 – 1.06	1.00	0.95 – 1.05	1.06	1.00 – 1.12
Currently smokes	0.96	0.91 – 1.01	0.98	0.91 – 1.06	0.93	0.85 – 1.01

OR: *odds ratio*; 95%CI: confidence interval of 95%.

As the increase in prevalence throughout the three waves of the SABE study (Table 1) could result from changes in the distribution of risk factors, so an analysis of the pair of waves was performed to test the significance of time *per se* in the increase of prevalences. Table 5 shows the results of the analysis of differences in the prevalence of the three cardiometabolic diseases through the waves. It was found that, after controlling for the available confounding variables, in general, there was a significant increase in the percentage of the diseases over time, with the exception of hypertension and CVD behaviors from 2006 to 2010.

DISCUSSION

The findings from the three waves of the SABE study are valuable not only for portraying the main NCDs in a large developing area, but also for allowing a speculation on the impact of therapeutic advances that occurred in the twenty-first century. Morbid conditions involved in the atherogenesis, which elevate the risk of cardiovascular death, were included in this analysis (hypertension, DM, and CVD), standing out as the most prevalent in the sample.

Table 4. Determinants of the presence of self-reported cardiovascular diseases for participants of the three waves of the SABE study, living in the municipality of São Paulo.

	2000		2006		2010	
	OR	95%CI	OR	95%CI	OR	95%CI
Gender	1.00	0.95 – 1.05	0.96	0.90 – 1.02	1.02	0.96 – 1.09
Age	1.01	1.00 – 1.01	1.01	1.00 – 1.01	1.01	1.00 – 1.01
Marital status						
Married	1.01	0.92 – 1.11	1.11	0.98 – 1.26	0.97	0.84 – 1.11
Separated/divorced	0.94	0.84 – 1.05	1.02	0.88 – 1.19	0.95	0.81 – 1.11
Widowed	1.01	0.92 – 1.12	1.09	0.96 – 1.23	0.92	0.80 – 1.06
Schooling (years)						
5 to 8	0.98	0.91 – 1.05	1.01	0.94 – 1.10	0.93	0.86 – 1.00
≥ 9	1.02	0.96 – 1.09	1.01	0.94 – 1.09	0.95	0.89 – 1.02
BMI						
≥ 27 kg/m²	1.00	0.96 – 1.05	1.03	0.98 – 1.09	1.04	0.99 – 1.10
Smoking						
Ex-smoker	1.06	1.01 – 1.12	1.09	1.03 – 1.15	1.05	0.99 – 1.11
Currently smokes	1.02	0.96 – 1.08	1.01	0.92 – 1.09	0.96	0.88 – 1.05

OR: *odds ratio*; 95%CI: confidence interval of 95%.

Table 5. Analysis of significant difference* of the presence of hypertension, diabetes mellitus, and cardiovascular disease between pairs of waves of the SABE study, living in the municipality of São Paulo.

	2006 in relation to 2000		2010 in relation to 2006		2010 in relation to 2000	
	OR	95%CI	OR	95%CI	OR	95%CI
Hypertension	1.11	1.07 – 1.15	1.03	0.99 – 1.07	1.14	1.10 – 1.18
Diabetes	1.04	1.01 – 1.07	1.05	1.01 – 1.08	1.08	1.05 – 1.12
Cardiovascular	1.06	1.03 – 1.09	1.00	0.96 – 1.03	1.06	1.03 – 1.09

*Results presented after control by the variables of the previous models (gender, age, marital status, education, BMI, and smoking); OR: *odds ratio*; 95%CI: confidence interval of 95%.

From the first to the third wave of the SABE study, the mean age of the sample and the predominance of the female gender were maintained. Although the participants partially differ from one phase to the other, the self-reported prevalences of the cardiometabolic diseases were initially confronted without adjustment. There was a initial expectation that the

frequencies of diseases could have increased, as the investigated population is composed of inhabitants of an urban area of a large metropolis exposed to an obesogenic, stressing, and polluted environment. In fact, from 2000 to 2010, the elevated prevalence of hypertension, DM, and CVD was confirmed, even after adjustments for the many confounding variables. Such an observation may be due to some improvement in the early diagnosis and treatment of the diseases in that period; reported results on the adherence to diets, specific drugs, and the control of clinical parameters periodically monitored corroborated to this occurrence (data not shown). In fact, the Ministry of Health, with the current epidemics of NCD, has been taking measures to combat this scenario, having launched a Plan of Strategical Actions for the Confronting of Chronic Diseases in Brazil 2011–2022[18], whose goals are coherent with the ones adopted in global terms[19].

A multicentered study about the prevalence of DM (census) carried out in nine Brazilian capitals and in the federal district in the late 1980s revealed that 7.6% of the individuals between 30 and 69 years of age had the disease, and this increased considerably with age[20]. São Paulo was the capital with the highest rates. Data were collected in two stages with probabilistic samples, the first being based on the questionnaires and the second one on the laboratory tests. Despite the availability of more recent prevalence studies, they are not nationwide. These studies were useful to show the growing trend of the DM in adults in cities of São Paulo, in which figures between 12.1 and 13.5% were found[21,22]. The percentage of individuals affected in the range of 60 to 69 years of age on the census (17.4%) differs slightly from the findings of the SABE study in its first wave (16.7%), whose sample indicated a more advanced mean age. Some divergence was expected considering the methodological differences between the studies. Information on the self-reported DM was available in the long-form census, demonstrating that almost half of the diabetic individuals were unaware of having the disease. Thus, the DM prevalence rates in the census, performed in 1988, and in the SABE study, in 2000, were very similar to each other, also considering they showed no difference between the genders.

The characteristics of the waves in our study allowed the comparison with more recent publications. In the health survey of the capital São Paulo, performed in 2003, found that 17.9% of the 872 noninstitutionalized elderlies stated being diabetic[23], an intermediate number between the first and the second wave of the SABE study (21.1% in 2006).

DM2 and hypertension are found frequently associated with each other, and both of them are associated with obesity[24,25], especially given that the accumulation of intra-abdominal fat leads to inflammation and insulin resistance, which predispose to a metabolism disorder of the glucose and the elevation of blood pressure[26,27]. Our findings on DM and hypertension may also be confronted with the ones by Vigitel, which is a surveillance system where the information on diseases and risk factors were reported by phone, despite the wide age range they investigated[14,28].

Taking into account only the individuals ≥ 65 years of age, 18.6% of them reported being diabetic[15]. As for hypertension, the proportion of self-reported hypertensive adults in the Vigitel[9] (23%) did not fall short of the rates (between 25 and 30%) reported in other

national studies in which the blood pressure was measured[10]. It is possible that the degree of unfamiliarity of the population with this disease is quite lower than the unfamiliarity with DM, because of its easier diagnostic method. The figures of hypertension in all the three waves of the SABE study (53.1%, 62.7%, and 66.7%) were well above the values herein mentioned. However, paying attention to the stratification by the age range used in the Vigitel, it is noticeable that between 55 and 64 years of age, 48.1% of the respondents reported being hypertensive (women: 38.4% [95%CI 36.3 – 40.5] and men: 55.7% [95%CI 53.8 – 57.6]), which rose to 57.7% among those who were ≥ 65 years of age (women 51.7% [95%CI 49.4 – 54.0] and men 61.5% [95%CI 59.7 – 63.3]). Therefore, the results about hypertension in the SABE study are of great importance so as to reinforce the severity of this public health problem in the Brazilian elderly population. They also pointed out the increasing behavior in the number of hypertensive patients with a high risk for cardiovascular events. Female gender was associated with hypertension in the cross-sectional analysis of the waves of the SABE study; however, a longitudinal analysis is necessary to better investigate this association among individuals with advanced age.

Our study reinforced the recognized association of DM and hypertension with excessive weight in all of its phases. Although there is a controversy regarding the appropriate cutoff point to identify the risk of morbidity and mortality among elderly[29], it was decided to stratify their BMI in the range of 27 kg/m^2[,17] for the purpose of this study. The role of adiposity gain in the risk of DM has been documented in cohort of the Nurses' Health Study[30]; similarly, the Physicians' Health Study pointed out BMI as a major risk factor for hypertension among eutrophic and overweight men[31].

Despite the cross-sectional nature of this analysis, consistent evidence obtained in longitudinal studies suggests that the interventions for the control of body fat (especially based on diet and physical activity) have the potential to improve this critical scenario identified in the SABE study when reaching senility. Some local initiatives to change the lifestyle are currently reported[32,33], though such effects in adults are important public health challenges[34]. It would also be desirable to improve the access of Brazilians to education, which may lead to better health and quality of life. During the 10 years of the SABE study, the representation of the stratum of lower education (0–4 years) is quite high; however, the good news is that it seems to be dropping over time. In the year 2000, 5 to 8 years of schooling was associated with a lower prevalence of hypertension; however, in subsequent years, higher education was not significantly proven to be connected to the diseases investigated here.

Smoking stands out as having lower impact than obesity, unhealthy diet, and physical inactivity as risk factors for DM2[35,36], but having high impact for CVD and cancer. Despite the initiatives by the health professionals and the government against the use of tobacco, it is still an important avoidable determinant of NCDs and premature death, especially in the developing countries. In the SABE study, this habit was investigated by a questionnaire, similar to many studies meant for the evaluation of interventions[37]. It is noteworthy that significant associations with hypertension and CVD were detected among former smokers. It is likely that this result is related to the fact that individuals stop smoking when diagnosed with

NCDs. In fact, in parallel to the increased prevalence rates of cardiometabolic diseases in the SABE study, a decrease in the percentage of smokers and an increase in the former smokers were observed. Nationwide antismoking campaigns, tax measures to raise the price of cigarettes, and the prohibition of smoking in public areas may have contributed to this behavior[38].

The prevalence of CVD increased gradually and significantly in the waves of the SABE study, in parallel with the other diseases examined even after a series of adjustments (Table 5). This trend in the prevalence of CVD was expected, since elevated blood glucose and blood pressure are well-established risk factors for cardiovascular diseases. Considering there was no change for average age, it is reasonable to speculate that within these 10 years there may have been an improvement in the diagnosis and control of the CVD and/or of the risk factors.

This work provides one more important contribution from SABE study regarding the knowledge on health conditions of the elderly in São Paulo. The selection and the size of the sample, the standardization in the collection, and the frequency are some of its qualities. However, this research, focusing on cardiometabolic diseases, failed to include the disorders of lipid profile, data that were not available in the study. Another limitation is the cross-sectional design, disregarding the distinct composition of the sample in each one of the three waves of the SABE study and the mortality, which is the subject of investigation of another substudy of the group.

CONCLUSION

In conclusion, self-reported DM, hypertension, and CVD presented high prevalence rates in the participants of the SABE study living in the city of São Paulo. The association of high BMI with these cardiometabolic diseases among the elderly who participated in this research suggests that the body fat may have favored such diseases, although the nature of this analysis does not allow ensuring the cause × effect relationship. It is possible that the increased percentage of people affected by the diseases, adjusted for the many variables, from the first to the third waves of the study, reflects an improvement in the conditions of the diagnosis and/or control of these diseases over time. An analysis of the longitudinal monitoring is necessary to verify this hypothesis.

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